Principals: John P. Hartley, District Office Manager Michael A. Powers, P.E., L.S.P. David R. Carchedi, Ph.D., P.E. John J. Spirito, P.E., L.S.P. Philip P. Virgadamo, P.E., L.S.P.



Mr. Dennis aRusso Interdivisional Manager R.I. Resource Recovery Corporation 65 Shun Pike Johnston, Rhode Island 02919

Re: Central Landfill Operable Unit 2 RI/FS

Progress Report No. 26

Work Period: March 22, 1997 through April 30, 1997

140 Broadway Providence Rhode Island 02903 401-421-4140 FAX 401-751-8613

Dear Mr. aRusso:

This letter with attachments serves as the 26th progress report prepared by GZA GeoEnvironmental, Inc. (GZA) associated with activities completed to date on the Central Landfill Operable Unit 2 Remedial Investigation/Feasibility Study (OU2-RI/FS). This progress report has been prepared in accordance with the requirements of Section 37 of the Administrative Order by Consent, U.S. EPA Docket No. I-87-1016. We prepared this letter on behalf of the RIRRC in accordance with the terms and conditions of our July 1, 1996 Environmental Engineering Services Contract.

Please do not hesitate to call Ed at ext. 3133 with any questions or comments regarding this progress report; or contact via E-mail at gzari@ids.net (Edward Summerly).

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A Subsidiary of GZA GeoEnvironmental Technologies, Inc.

Edward A. Summerly, P.G.

Project Manager

EAS:rll

Attachments: Progress Report No. 26

Boring Logs (3)

cc: Mr. John Courcier/USEPA

Ms. Becky Cleaver/HNUS

Ms. Laurie Sclama/RIDEM

PROGRESS MADE THIS REPORTING PERIOD

March 22, 1997 through April 30, 1997

DELIVERABLES AND CORRESPONDENCE THIS PERIOD



GZA has not submitted any correspondence to EPA and RIDEM on behalf of our client, the Rhode Island Resource Recovery Corporation (RIRRC), during this reporting period.

GZA has received the following correspondence from EPA and/or RIDEM regarding this project during this reporting period:

RIDEM's approval of GZA's proposed revision to well decommissioning protocols, dated April 25, 1997.

On April 15, 1997, GZA Project Manager Edward Summerly and Project Engineer Stephen Kline participated in a conference call with EPA Project Manager John Courcier and EPA's oversight contractors Becky Cleaver and Michael Healey from HNUS. The purpose of the call was to discuss the impact of the loss of the middle sampling zone (119' to 134') in MW97-ML10 to the overall goals of the deep well installation project (Task 4A). After reviewing GZA's technical rationale the EPA concurred with our actions regarding the elimination of Zone B and at this time will not require the placement of an additional well to replace the lost zone. During this conference call we also discussed the decommissioning of the eight Hot Spot area wells and need to evaluate the EPA's OU2 pump test data in our future geohydrological assessments (i.e., OU2 Task 3A and the RI/FS reports).

On April 18, 1997, GZA's remedial investigation project staff and risk assessment project staff conducted a full day of meetings to coordinate and initiate the OU2 Human Health and Ecological Risk Assessment (RA). During this meeting GZA also addressed EPA and RIDEM's final comments to the draft Risk Assessment Work Plan. A Final OU2 Risk Assessment Work Plan document is forthcoming. The development of the RA Report will be conducted by a project team under the direction of Lisa Campe of GZA's Newton, Massachusetts office.

WORK ACCOMPLISHED THIS PERIOD

Multi-Media Sampling and Analytical Program/Task 1- Round 2

The OU2-Round 2 analytical data, validated by ECCI of Gorham, Maine, has been entered into our environmental monitoring database. These data are currently being consolidated with the Round 1 data, evaluated and utilized in the OU2 Human Health and Ecological Risk Assessment (RA). In addition, analytical data from the newly installed wells (see Task 4A) was received from Mitkem Corp (the CLP laboratory) on April 18, 1997. The

data was then sent to ECCI for Tier III data validation, data usability, and site chemist's evaluations on April 25, 1997. We anticipate receiving the validated data the week of May 19, 1997 in time to be evaluated as part of the RA.

Piezometric Measurement Program/Task 3A



GZA is beginning to evaluate the piezometric data collected during the 15-month monitoring program. This geohydrological data will be incorporated into the completion of the tasks described in OU2-RI and the Technical Memorandum entitled, <u>Delineation of Groundwater Contamination Emanating from the OU1-Area</u>, dated February 2, 1996. As mentioned above, GZA will incorporate some information from the EPA's pump test monitoring into our geohydrological assessment.

Deep Multi-level Well Installation (MW97-ML10)/Task 4A

An "as-built" survey of newly installed monitoring well locations (MW97-54, MW97-ML10A and MW97-ML10B) was performed on April 17, 1997. The three "as-built" boring logs are attached. In addition, after receiving the analytical data from the first round of sampling of these three wells, GZA began the second, and final round of groundwater sampling at these locations using full CLP protocols and QA/QC procedures as described in the SAP. The groundwater sampling, analytical and QA/QC protocols are summarized and attached in tabular form. We mobilized to the site on April 18, 1997 and purged a minimum of three standing well volumes from each of the wells. These newly installed wells were allowed to recover for four days prior to sampling MW97-54, MW97-ML10A, and MW97-ML10B by low flow protocols. It should be noted that due to extremely low recovery rates ML10B was not allowed to fully recover prior to sampling. We anticipate receiving the analytical data for this SDG by the week of May 19, 1997 with validation immediately following.

Residential Well Survey/Task 5A

GZA is currently finalizing the OU2/Task 5 Residential Well Survey Report. We anticipate submission of this report to EPA and RIDEM for review during the next reporting period. The results of the residential well sampling and analyses will be incorporated into the Risk Assessment.

UPCOMING EVENTS/ACTIVITIES

FIELD ACTIVITIES

We believe that the field investigation program for the Operable Unit 2 Remedial Investigation is complete pending additional data needs identified during the Risk Assessment.

Central Landfill Operable Unit 2 - RI/FS Progress Report No. 26 Page 2 of 3

REPORTS, CORRESPONDENCE AND MEETINGS

GZA is currently reviewing the revised schedule for the completion of the OU2 RI/FS process. We intend to issue a revised, detailed project schedule during the next reporting period.

KEY PERSONNEL



There have been no changes to the project staff.

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ANALYTICAL AND QA/QC SAMPLE SUMMARY RECENT OU2 GROUNDWATER SAMPLING

Central Landfill - Johnston, Rhode Island

SAMPLE DELIVERY GROUPS	SAMPLING DATES	ANALYTICAL SAMPLES	TYPE OF ANALYSES ⁽¹⁾	QA/QC SAMPLES	COMMENTS
Groundwater Sampling (2-SGD)				In the state of th
SDG #RW43	3/11 - 3/17/97	RW31/004 RW43/007 RW43/167 MW97-54 MW95-ML9C MW97-ML10A MW97-ML10B	FULL CLP(2) WATER QUALITY PARAMETERS (3)	MW97-ML10A MS MW97-ML10A MSD MW97-55	Peristaltic pump blank Matrix Spike Matrix Spike Duplicate Blind Duplicate for MW97-54 Trip Blank
	<u> </u>			T	Peristaltic pump blank
SDG #MW54	4/23 - 4/24/97	MW97-54 MW95-ML9C MW97-ML10A MW97-ML10B	FULL CLP(2) WATER QUALITY PARAMETERS (3)	EBGW042497 MW97-54 MS MW97-54 MSD MW97-55 TBGW042397 TBGW042497	Matrix Spike Matrix Spike Duplicate Blind Duplicate for MW97-ML10A Trip Blank Trip Blank

NOTES:

- 1) Analytical Method requirements are described in the November 6, 1995 "Sampling and Analysis Plan Final Draft" (SAP) and "Quality Assurance Project Plan - Final Draft" (QAPP) for the Operable Unit 2 Remedial Investigation Central Landfill.
- 2) Full CLP includes TCL Volatiles and semi-volatiles with GC/MS library search, PCBs and pesticides, TAL metals including cyanide, and a standard CLP data package for each.
- 3) Water Quality Parameters for groundwater samples include the 15 analytes presented on Table 2, page 6 of the SAP.

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REMARKS: .

- 5. Zone is producing a significant volume of water.
- 6. Neither rotten rock nor bedrock interface encountered by 47'+.
- 7. Casing separated 13'+ from bottom of borehole could not retrieve borehole was abandon by tremied in place bentonite/cement grout on 1/21/97.

NOTES:

- 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.
- 2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

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ZA GEOENVIRONMENTAL INC.
40 BROADWAY, PROVIDENCE, RHODE ISLAND

REPORT OF BORING NO.	MW97-54
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REMARKS:

- 5. Air hammer on-soil holds more air after 48'.
- 6. Push 3" split spoon with 1,000 lbs. pressure only able to work 6"+ into strata.
- 7. A groundwater monitoring well constructed of 2" ID Sch. 40 PVC was installed with a 15' (10 slot) screen section to a depth of 47' and topped with 34.0' of solid riser pipe (2.0' above ground surface) on 1/22/97. The borehole annulus was backfilled with 4' of bentonite chips (51.5' to 47.5), 16.5' of filter sand around screen section (47.5' to 31'), a 3' bentonite seal (31' to 28'), and 28' of cement/bentonite ground (28' to 0'). The well is protected by a 4" ID x 5' locking, steel guard pipe set 2.5' below ground surface in

NOTES:

- 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.
- 2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING NO. MW97-54B

SAME SAME	074.0	OENNIE	ONMENT	AL INC					PROJECT			REPO	RT O	F BOF		10. MW	•	0
### ### ### ### ### ### ### ### ### ##	نکA Gl	OF DATE	- DBUNIU 	ENCE PHOD	DE ISLAND			CENTRA	L LANDFILL OUZ	/TASK 4A								_
SOTION CONTINUES CONSIST AND SECURITION SOURCE CERT SOURCE	140 BH	CADWAT	, PAOVIL	E140E, 74 10E)		İ								FILE 1	VO. 318	42	_
DOTING COL. D.L. MAREE ENVIRONMENTAL SORING LOCATION SEE EXPENDITION FLOW MODIFIED	GEOTE	CH/GFO	-IYDROL (GICAL CON	SULTANTS										CHKD	BY EAS	<u> </u>	_
CONTROL CONT						AL.					TION LOC	OITAC						- 1
CAX NEGWREER STEP-KHILINE STEP			-					GROUND S	SURFACE ELEV.	293.5			DAT	JM	NG	VD		- 1
SAMPLER_UNLESS_OTHERWISE_NOTED_SAMPLER_CONSISTS_OF			-						DATE START	1/8/97		D/	TE E	ND	1/15	5/97		
AZ SPLIT SPOOND ROVEN USING A 140 B. HAMMER FALLING 30 N			-			CONSISTS OF				GROUNDWA	TER REA	DING	3					
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 1807 1300 5.0 10.0 0.5 HOURS 1007								DATE	TIME	WATER	CASIN	G		5	TABIL	ZATION	TIME	
10 10 10 10 10 10 10 10								1/8/97	13:00	5.0	10.	0			0.	5 HOURS	s	
ACAINS SIZE: 10%* OTHER 9 789 5.5 70* PNEUMATIC AIR HAMMER ACAINS SIZE: 10%* OTHER 9 789 5.5 70* PNEUMATIC AIR HAMMER SAMPLE DISCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION DESCRIPTION INSTALLED TESTING K TESTING K SAND AND FIELD A B B S S 1 20 10 1 1 2 127 SAND, some fine to coarse Gravel G-1 1 8 28-38 SAND and fine to medium Gravel, little+ Silt G-1 1 8 28-38 SAND and fine to medium Gravel, little+ Silt G-1 1 8 28-38 SAND, some fine to coarse Gravel G-1 1 9 3 248 SAND, some fine to coarse Gravel G-1 1 8 28-38 SAND and fine to medium Gravel, little+ Silt G-1 1 8 28-38 SAND and fine to medium Gravel, little+ Silt G-1 1 8 28-38 SAND, some fine to coarse Gravel G-1 1 8 28-38 SAND, some fine to coarse Gravel G-1 1 8 28-38 SAND, some fine to coarse Gravel G-1 1 8 28-38 SAND, some fine to coarse Gravel, trace SAND, some fine to coarse Gravel, trace SAND, some fine to coarse Gravel, trace SAND, some fine to coarse Gravel, trace SAND, some fine to coarse Gravel G-1 1 8 24-20 SAND, some fine to coarse Gravel G-1 1 8 24-20 SAND, some fine to coarse Gravel G-2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2					D, CASING DA	VEN USHIO				5.9	70.	.0				1 DAY		
DETITION SAMPLE SAMPLE SAMPLE SAMPLE DESCRIPTION STRATUM DESCRIPTION				OTHER 97	7/8 & 5 7/8" PNEU	JMATIC AIR HA	MMER			I								
BLOWIS NO PENMEC DEPTH (FT) BLOWIS®: BURMISTER (CLASSIFICATION DESCRIPTION NISTALLED TESTING K			1070					MPLE DESCRIP	TION	STRATU	м		EQL	JIPME	NT	F	IELD	R
S-1 24/16 0-2 8-9 Medium dense, dark brown, fine to medium 10" TOPSOIL A B 55 1 24/16 ND 12-7 SAND, some Site (roots and other organics) SAND AND SAND			NO			BLOWS/6"	BURN	(ISTER CLASSIFI	CATION	DESCRIPT	ION	l	INS	TALL	ED	TE	STING	K
S-1 24/16 O-2 B-9 Medium drots and other organics) SAND AND SAND AND Changing after 10" to tan, fine to coarse SAND AND GRAVEL FILL B Goobbles) E R R Goobbles) E R R Goobbles E R R Goobbles E R R Goobbles E R R R Goobbles E R R Goobbles E R R Goobbles E R R R Goobbles E R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles E R R R Goobbles Goobbles E R R R Goobbles Goobbles Goobbles E R R R R Goobbles Goobbles Goobbles Goobbles Goobbles Goobbles E R R R Goobbles	(-17	BLOWS	,,,,					4 14 #:== 1	and the second	10° TOPS)II			T,	\mathbf{T}		55	1
127 SAND, comes (roots and originals) SAND to an interest to coarse SAND to an interest to coarse SAND to an interest to coarse SAND to an interest to coarse SAND to an interest to coarse SAND to an interest to coarse SAND to an interest to a sand	İ		S-1	24/16	0-2	8-9	1					1		ľ			-	
SAND, some fine to coarse Gravel FILL B (Cobbles) E R R I I I I I I I I	1					12-7	SAND, some Si	it (roots and other	organics)									-
Solution Solution	l						changing after 1	10° to tan, fine to o	coarse	GRAVE	L	1		-				
S S S S S S S S S S							SAND, some fir	ne to coarse Grav	el	FILL		В						l
S-2 24/2 5-7 32-26 Very dense, olive/brown, fine to medium SAND and fine to medium Gravel, little+ Silt S S S S S S S S S	_	<u> </u>]			(Cobble	s)	E	R	1	٦	į		3
S-2 24/2 5-7 32/26 very derate, intercholomic, in the content of the medium Gravet, lettle+ Sitt (saturated) S-3 S-4	5		 			27.55	Vons donce of	waterown finates	nedium			N	ı	ŀ			16	
G-1			S-2	24/2	5-7	32-26	4			1		1	s		,	į		
10		L	G-1		6	28-36	SAND and fine	to medium Grave	er, intre+ Sin			1	1 1	- 1	- 1			
10	1		l				(saturated)			8		-{ -	1 1	- 1	- 1			ļ
10 S-3 248 10-12 3-6 Medium dense, olive/brown, fine to coarse SAND, some fine to coarse Gravel, trace SANDS A Q Q Q Q Q Q Q Q Q	l									1		^	R		P			1
S-3 248 10-12 3-6 Medium dense, olive/brown, fine to coarse STRATIFIED SANDS A A A A A A A A A	١		\vdash				7			l l		L	1 1			ļ		4
15	10		+	 	12.42	0.6	1	alive/brown fine	to coarse	STRATIF	IED	1			-		1.5	
15 SAND, burie life to coarse State, state SAND, burie life to coarse State, state SAND, burie life to coarse State, state SAND, little-Sift		<u> </u>	S-3	24/8	10-12		7			SAND	ıs	A	1					1
15	1	<u></u>	<u> </u>	<u> </u>	ļ	4-10	SAND, some ti	ine to coarse Grav	ei, trace		•	ı			ì			1
15	1	l	<u> </u>	<u> </u>			Sift			1		1			-			
S-4 24/20 15-17 21-23 Dense, clive/green, fine SAND, little- Sitt interbedded with layers of coarse Sand, some fine to medium Gravel S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Sitt 21' T T 1.5	1				l		_					ľ	1		- 1			1
S-4 24/20 15-17 21-23 Dense, olive/green, fine SAND, little- Sitt interbedded with layers of coarse Sand, some fine to medium Gravel S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Sitt 21'	۱.,	—	1							(COBBL	.ES)	Α	1					1
18-19 interbedded with layers of coarse Sand, G R O U U U U U U U U U	'5	—	 	1	45.17	21.22	Dense olive/o	reen tine SAND.	little- Sift			1	-			i	ND	1
Some fine to medium Gravel		<u> </u>	S-4	24/20	15-17		7			l		G		1]		
20 S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Silt 21'		<u> </u>	ֈ	ļ	 	18-19	_		e Sara,	ļ			1					1
20 S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Silt 21'	1			ļ		 	some fine to n	nedium Gravel				1			1	1		
20 S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Sith 21'	1		1							ŀ		10	1			1		١.
S-5 20/2 20-21.7 9-3 Dense, gray, fine SAND, trace Sith 21'	20					<u> </u>						ļυ	1	1	1 1	i		1 °
25	-		- 6.6	20/2	20-21.7	9-3	Dense, gray, 1	line SAND, trace	SiN	21'		Т				İ	1.5	
Second S	-	 	3.5	20,2	202		7						1	1				
24.5' S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4* 27.5' 10 gray, fine to coarse SAND, little blue and orange, fine Gravel 30' BOULDER 31'		—	-	 		40-30/2	-1			GRAV	/F1		1		1 1			
25 BOULDER S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4* 27.5' 10 gray, fine to coarse SAND, little blue and orange, fine Gravel 30 BOULDER ND ND SANDY GRAVEL 30' BOULDER 31'		<u></u>	 				⊣					1				1		
S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4* 27.5' ND SANDY GRAVEL 30' BOULDER BOULDER 31' SANDY GRAVEL 31' S					_		4			24.5	••••••				$ \ $	l		
S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4* 27.5' ND SANDY GRAVEL 30' BOULDER BOULDER 31' SANDY GRAVEL 31' S	25	; [<u></u>	1			_			- [-
S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4* 27.5' ND										BOUL	DER							-
S-6 24/7 27.5-29.5 2 Very loose, fine SAND, changing after 4" 27.5	1		┪┈							1		ı			11	1		1
2-2 to gray, fine to coarse SAND, little blue and SANDY GRAVEL orange, fine Gravel BOULDER 31'	1	-	+-		 	 	Venuleace #	ne SAND chancie	ng after 4°	27.5						1	ND	·
30 3 3 orange, fine Gravel 30' BOULDER 31'	Ì	-	S-6	24/7	27,5-29.5					F	RAVFI					1		-
BOULDER 31'	-	<u> </u>	 			2-2			me blue and	1				1				
31'	3	· L				3	orange, fine	Gravel						1		İ		
	-		<u> </u>				_			BOUL	DER							
COBBLES										31'						1		- [
			1							COB	BLES	1		1	1	, I		-

trace fine to coarse Sand, trace Sitt Field screening performed with a Thermo Environmental Instruments organic vapor monitor (OVM) Photoionization Detector (PID) equipped with an 11.8 eV lamp. Readings are in parts per million (ppm). ND indicates less than 0.1 ppm in soil sample headspace. Based on subsequent analytical testing it appears that the elevated

Very dense, gray, fine to coarse GRAVEL,

headspace readings were potentially caused by water vapor and extreme cold.

S-7

- Sample is saturated. Poor recovery took grab sample (G-1) from hammer may have been pushing a cobble. Sample has organic odor (like black licorish).
- Approximately 1.5" rounded gravel in soil catch of sampler resulted in low sample recovery.

35-35.5

- Split spoon refusal very poor recovery drift cuttings indicate fine to coarse gravel (quartz, mica granite) rounded edges, trace fine sand, trace silt.
- Encountered granite boulder from 24.5'+ to 27.5'+ Cyclone returned angular granite chips. Borehole making much more water.
- Began with split spoon sample on 1/9/97 only 8' of water in casing (i.e., DTW=19.5') at 27.5ft hydrostatic surface at 5'+.

50+/5*

Split spoon refusal at S-7 took grab sample G-2 at 35'+ from cyclone.

MW97-ML10 BORING NO.

STRATIFIED SAND AND GRAVEL

GZA GEOENVIRONMENTAL INC. 140 BROADWAY, PROVIDENCE, RHODE ISLAND PROJECT
CENTRAL LANDFILL OU2/TASK 4A
JOHNSTON, RHODE ISLAND

REPORT OF **BORING NO.** <u>MW97-ML10</u>

SHEET 2 OF 8

FILE NO. 31842

CHKD BY EAS

GEOTECH/GEOHYDROLOGICAL CONSULTANTS

ретн	MINIFT			SAMPLE		SAMPLE DESCRIPTION	STRATUM			IPMEN		FIELD	R
-		NO	PEN/REC	DEPTH (FT)	BLOWS/6°	BURMISTER CLASSIFICATION	DESCRIPTION			FALLE:	1	TESTING	K
							CTDATIFIED CAND		^	ľ			
							STRATIFIED SAND	_	П				
							AND GRAVEL	В					1 1
						1		E	R	P]	1 1
40								N		- ['	\	7.0	8
		G-5		40+		Light brown, fine GRAVEL and medium to		s	s	s	ļ		
				ļ		coarse Sand, trace Silt		E	E	E	ļ	Ì	
]		Α	R	R			
]		L	П	ì			
45									Н				1 1
1		G-6		45+		Yellowish brown fine to coarse SAND and		A	H		1	ND	
1						Gravel, fittle (-) Sitt		a	$ \ $	- 1		ĺ	
1								U		-	1	}	1 1
1			İ			1	49'	A			1	ļ	1 1
50	1				1	1	HIGHLY]	П	ļ	ļ	1	
~	 	G-7		51+		White and black GRANITE Fragments	WEATHERED	G	Н	1		ND	
1	2	G-7		317	-	Yellowish brown Silts	ROTTEN	R					
1		 	-	 		, enominal province in a	ROCK	0				İ	
	2	 		ļ	<u> </u>	1		U			1		
	2		<u> </u>	 		₹	55'	T	П				
55	2	 	 	 	 	-	GRANITE	1	Н			ND	10
	3_	G-8		55+	<u> </u>	White, GRANITE Fragments, cream colored	1		П			"	'`
1	2	-	 			Sitts (more sand consistency)	BEDROCK			li			
1	2	G-9	 	58+	 	4		1			1		1
1	2	├				4				l i			
60	2_	-				10° ID steel casing installed to 60'		}				ND	11
	2	G-10	 	60+									
	2	<u> </u>	 	ļ	<u> </u>	4	63'	-					1
1	2	<u> </u>	ļ	ļ	ļ	Fracture zone: (Red Silt 63'+ to 64'- borehole	FRACTURE ZONE	•	1	1	1	1	1
l	2	<u> </u>	ļ			remains open)	64'		ì	1 1		ND	-
65	2	ļ	ļ						1	1			-
	2	G-11		65+		Light gray GRANITE (consistency of coarse					1	1	
1	2	1				Sand with cream/white Silts)		67'					
1	2	<u> </u>	<u> </u>	<u> </u>			İ					ND	
	2					6" ID steel casing installed to 69.4"			4				
70	2	G-12		70+	<u> </u>	Light gray GRANITE (slightly more Silts)		69,	_			_	
	2							701	L				12
]	2								L	F	S		13
	2								s]:]	A		1
1	3	1				7			С][]	N		
75	3	1				3			R	T	D	1	
	3	G-13		75+		Light gray GRANITE (cream/white Silts)	· .		E	E			
	3	-	1	 	 		77' FRACTURE ZONE		N] P		ND	
1	3	 	+	 	 	Fracture zone (brown silts - easier drilling)	78'		۲	1			1
3	1 1					<u> </u>	1,5			است			

REMARKS:

- 8. Air hammer returns are very silty. Borehole making approximately 10+ gpm.
- 9. Rock increases in hardness at 55'.
- 10. On 1/9/97, spun casing to 58'. Advanced bit in front of casing 2'-borehole is not self supporting.
- 11. On 1/10/97, spun casing to 60' borehole making less water sitts are cream colored competent rock drilled open borehole 10' and rock remains open-grouted in 6-inch casing.
- 12. During the grouting of the 6" casing, the 10" casing became stuck could not be removed.
 - 3. Grout allowed to set up over weekend before advancing 6-inch ID open borehole drilling on 1/13/97.

	PROJECT	F	REPORT	OF BORING NO.	MW97-ML	10
GZA GEOENVIRONMENTAL INC.	CENTRAL LANDFILL OU2/	TASK 4A		SHEET	3 OF 8	
140 BROADWAY, PROVIDENCE, RHODE ISLAND	JOHNSTON, RHODE IS			FILE NO.	31842	
TANTS				CHKD BY	EAS	
GEOTECH/GEOHYDROLOGICAL CONSULTANTS	<u> </u>	OTD ATUM		ECHIPMENT	FIELD.	Ī

EOTE	CH/GEO	HYDROL	OGICAL CON	ISULTANTS						KD BY		_
РТН	MINFT			SAMPLE		SAMPLE DESCRIPTION	STRATUM		UIPMI		FIELD TESTING	A K
1	,,,,,,	NO	PEN/REC	DEPTH (FT)	BLOWS/6*	BURMISTER CLASSIFICATION	DESCRIPTION	iN	STALL	Eυ	ND	一
	1	G-14		80+		Light gray GRANITE (cream/white Silts)			В		NU	
	4											
Ì	2					Fracture: brown Silts larger red granite	83'	83'	1			1
ŀ						fragments (83'+)						1
ŀ	2						GRAY		B			ì
5	2	 		 		1	GRANITE	85'	ı			l
					<u> </u>	1			s	ŀ		
	1			 		4	00'	İ	E		1	1
	_ 1_			ļ		4	88'		R	ŀ	1	1
	4			<u> </u>		_	FRACTURE ZONE	1			ND	
ю	4_	G-15	<u> </u>	90+	<u> </u>	Fracture: brown Silts larger red granite	80,	- 1	1		"	İ
	4					fragments (eratic hammer movement)	GRAY GRANITE	N	1	1		
	4						92' FRACTURE	⊣s			ļ.	1
	1	1						E		1	ŀ	1
			†	1		7		A	-			1
	<u> </u>	+				Granite: gray Silts (quartz sand fragments)		L				1
95	2_	+	-	 -	 		1	İ	1			
	2	╁	 	 	 	┪		A	1			
	2	4			<u> </u>		96'	۵	Į.	1	ļ.	1
	1		_	<u> </u>		Fracture: (98'+) brown silts	90	٦,	•			-
	1					4	2257 2747			1		Ì
100	1				 	_	SOFT GRAY	A	-1			
	1					_	GRANITE		1	1		l
	1				<u> </u>	_		G				1
	1							R			1	ļ
	1						GRADUALLY	0		ì	1	
	1	G-16		105+		Gray GRANITE (fine to coarse Sand	HARDER	U	١		ND	1
105		G-10	<u>'</u>	1		fragment - gray Silts)	GRAY GRANITE	Т	-			ı
ĺ	2		+					Ì	-			- [
	2			+		7		ļ		1		
1	2				+	┥		1				-
	2	-										
110	2					-						
1	2										ı	-
1	2					_						
	_ 2											- [
İ	2							1				
115			7	115+		Fracture zone: red/orange GRANITE	115'		- [1		-
1	2					fragments with brown Sitts	FRACTURES			1	ŀ	
1	2	$\neg \neg$					GRAY					
1	2					7	GRANITE		- }			
	2		1	· · · · · · · · · · · · · · · · · · ·	1 _		ì	i		- 1	l l	- 1

REMARKS:

14. Drill rig bucking-softer rock.

NOTES:

GZA

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.

2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

MW97-ML10

GZA GEOENVIRONMENTAL INC. 140 BROADWAY, PROVIDENCE, RHODE ISLAND

GEOTECH/GEOHYDROLOGICAL CONSULTANTS

PROJECT
CENTRAL LANDFILL OU2/TASK 4A
JOHNSTON, RHODE ISLAND

REPORT OF BORING NO. MW97-ML10

SHEET 4 OF 8

FILE NO. 31842

JHING NO.	MAABL-ME	<u> </u>
SHEET	4 OF 8	
FILE NO.	31842	
CHKD BY	EAS	
PMENT	FIELD	R

DPTH	MIN/FT.			SAMPLE		SAMPLE DESCRIPTION	STRATUM	E	QUIPN	IENT	FIELD	R
		NO	PEN/REC	DEPTH (FT)	BLOWS/6"	BURMISTER CLASSIFICATION	DESCRIPTION	11	ISTAL	LED	TESTING	к
121	1					Fracture: Brown Silt red/orange granite	120' FRACTURES		В	ļ		
	2					fragments					l l	
	1.5						122'		İ			
	1.5						FRACTURE		R			
125	1.5	G-18		125+		Large granite fragments (more orange			þ		ND	
	1.5					pink/gray Sitts)	SOFTER STONE		s			
	1							В	E			
	1						GRAY	Ε	R			
	1							N	1			
130	1					Siltier discharge GRANITE is blue/black/dark		s	1			
	1					gray		E	1		ì	İ
	0.5					7	132'	A				
	0.5		† · · · · ·			Fracture zone: Tan/yellow/black GRANITE	FRACTURES	L				
	1			<u> </u>		Fragments, tan Silts (132' to 133')	133'					
135	1					1		A				
"						7		a		l		
	1.5	G-18					138'	U	İ			
	2.0	G-10	<u> </u>	138+		Black and white GRANITE with gray Silts	GRADUALLY]_			ND	
	8.0			1007		,			-	1		1
140	5.0	 	1		<u> </u>	1	HARDER GRAY	G			ļ	15
140		 	 			1		R				
	5.0	 	 	+	 	1	GRANITE	0			1	
1	12.0	 		 	 	1		U				
	3.0			 		┪		T				
	3.0	 	 	-	-	Black and white GRANITE with green tint to				1		
145	3.0	1	 	 	 	quartz - gray Silts				1		
	3.0	1	-	<u> </u>	 	qualiz - gray onto			ļ			İ
	3.0			<u> </u>		7						1
	3.0	+	 		 	┪						ŀ
	3.0	1		450		Plack and white CDANITE grov Sitts		1	1		ND	
150	3.0	G-20	+	150+		Black and white GRANITE - gray Silts		1				
-	3.0	1	╅		 	╡		İ			Ì	
1	3.0	+	 	 		Frankling Language in seture with grow	152'			1	1	16
1	0.5	 	 		 	Fracture: Large pieces in return with gray	132	1				
	5.0	+	+		 	Sits (152'+)					İ	1
155		+-	 	+	1	-						
	5.0	+	+	+	 	┥						
	5.0	 	 	+	-	┥						
	5.0	+	 	+	 							
160	5.0 5.0		-	 	 -	-1					}	

REMARKS:

- 15. Granite became very hard hammer not progressing. Pulled pneumatic hammer from 142. Replace bit continued drilling.
- 16. Drill head dropped 6"+ in approximately 30 seconds and then slowed again.

NOTES:

GZA

- 1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.
- 2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

SZA GEOENVIRONMENTAL INC.	
40 BROADWAY, PROVIDENCE, RHODE ISLAND	

REPORT OF BORING NO. MW97-ML10

SHEET 5 OF 8

FILE NO. 31842

CHKD BY EAS

ACOTECU/CEOHYDBOL	COLCAL	CONSULTANTS

	MIN/FT.		OGIOAL COI	SAMPLE		SAMPLE DESCRIPTION	STRATUM	EQUIPM		FIELD	R
PIH	MIN'FI.	NO	PEN/REC	DEPTH (FT)	BLOWS/6°	BURMISTER CLASSIFICATION	DESCRIPTION	INSTAL	LED	TESTING	K
61	5	G-21	T CHAPTED	160+		Black and white GRANITE - gray Silts		В	İ	ND	
٠	3						162'				1
						Small fractures? - drill rig jumped	163' FRACTURES				1
	3						GRAY			ł	
	3					1	GRANITE	R	İ	Ì	
165	3_	 	 	 		1			}	1	1 1
	4					1		s]	1
	3		<u> </u>	<u> </u>	 	4	168'	E		ND	17
	3	<u> </u>	<u> </u>	ļ <u> </u>		Fracture: (168'+)	168	l R		"	"
	3				ļ	4					1 1
170	3	ļ			ļ	4			1	!	.
	3	G-22		170+		Black and white GRANITE fragments (fine					18
	4					to coarse SAND sized particles- slight green			В		1
	5					tint to white fragments).		1 1	E		1 1
		 							N		1 1
	5	+	1		-	7		1 1	s	ļ	1 1
175	5	+	 -	 		7		1	E	1	1 1
	5	 	+		 	-			Α		1
•	5	┼			 	┥			L		1 1
	5_	↓	<u> </u>	 		-					1
1	5_	_			 	4			A		1 1
180	5								a	1.1	19
	5	G-23		180+		White and gray GRANITE (still tint of green)	1		1	'''	'
ł	5		<u> </u>			white/gray Silts trace black/yellow and orange			U		
1	4					fragments			^		1 !
1	3							1 1			
185						Not making any more water slightly siltier	SOFTER ROCK		G		
	3		1					1 1	P		
	3	1	 						0		-
1		+-				7			U	-	1
	4		┪			7	I		Т		
	4				-	7		1 1	-		-
190			-			White and gray GRANITE (still tint of green)	HARDER AGAIN	1 1		1.1	İ
	5	G-2	4	190+	 	white/gray Sitts trace black/yellow and orange				İ	1
	5			_	- 			1 1]	
1	5				_	fragments				į	
1	5								İ		
195	5 5					_		1 1	-		1
1	6										
Ì	6							1 1		l	
	5							1 1		ŀ	
1	5										-
20											-
1						_					
1						- 	1				
1											L_
1_	EMARKS	L_		1						. –	

REMARKS:

- 17. Drill rig jumped at 168'+ larger rock fragments. Borehole appears to be making more water.
- 18. Driller has increased pressure on downward head (he says won't drag along the inside of borehole when questioned).
- 19. PID reading may be affected by moisture on the lamp, however, PID calibration check as acceptable.

NOTES:

GZA

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.

2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

ZA GEOENVIRONMENTAL INC.	
10 BROADWAY, PROVIDENCE, RHODE ISLANI)

REPORT OF BORING NO. MW97-ML10

SHEET 6 OF 8

FILE NO. 31842

CHKD BY EAS

GEOTECH/GEOHYDROLOGICAL CONSULTANTS

COTU	MINIFT.			SAMPLE		SAMPLE DESCRIPTION	STRATUM	EQUIP	MENT	FIELD	R
UFIN	In Indian	NO	PEN/REC	DEPTH (FT)	BLOWS/6"	BURMISTER CLASSIFICATION	DESCRIPTION	INSTAL	LED	TESTING	к
201	5	G-25		200+	·	White and gray GRANITE (still tint of green)	HARD	В		ND	. l
	5					white/gray Silts trace black/yellow and orange	GRAY	- [1	1	
[5					tragments (more silt and coarser fragments)	GRANITE				
	4]		R			
205	4							ļı .			
	4							s	В		
1	4							E	E		
	4						ļ	R	N		
1	4	-				1			s		
210	4					1			E	į	
1.0	1	G-26		210+		Mostly white GRANITE fragments, little			A	ND	
1	5	0.20				black (water is even sittier fragments are			L		
1	5	 				smaller)					
1	7	<u> </u>							A		20
	3					More black flecks return of green tint to	SOFTER ROCK		a		
215	3	 	 			white			υ		
	4		 	 				1	A		
1	4		1		<u> </u>					1	
1	3	 	 			1			G		1
	3	G-27	<u> </u>	220+		Larger/coarser granite fragments			R	ND	
220		G-21	 	2207		black and white GRANITE			0		1 1
	3	+	 	 			İ		U		1 1
	3	+		+	T	1			T		1 1
	3	 	1		-	7					1 1
	3	+-	 		 	7		1			
225	3	+	+		 	1		1 1			
1	3	+	+	 		1		1 1			
1	3	╅╾		+	1	7				ł]]
	3	 	 	1				1			
	3	100	 	230+	1	Larger/coarser granite fragments		1 1			1 1
230	3	G-28	<u>'</u>	230+	 	with return to green tinit				ND	1 1
1	3	+		 	+	The state of the s					
1	3	+		 							1 1
1	3	 			1						
235						Dropped from 234.5'+ to 235'+ very quickly	234.5'+	<u> </u>			
235		+		*	1	(no change in silt color)	FRACTURES]			
1	3	 		<u> </u>	- 		235'+	7		l	
1	1 4	+			-	7		1			
1	3	+-			 	-					
240	3	+	 		 						
		1									

REMARKS:

20. On 1/14/97, air hammer ringing more loudly at 213'+ - bit is not cutting the bedrock - borehole making 2+gpm. Pulled tools to investigate. Bit is broken replaced and returned to drilling.

NOTES:

GZA

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.

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ZA GEOENVIRONMENTAL INC.
10 BROADWAY, PROVIDENCE, RHODE ISLAND

REPORT OF BORING NO. MW97-ML10

SHEET 7 OF 8

FILE NO. 31842

CHKD BY EAS

SECTECH/GEOHYDROL	COLCAL	CONCLUTANTS
CROYECH/GEOHYDROL	OGICAL	CONSULTANTS

	MIN/FT.			SAMPLE		SAMPLE DESCRIPTION	STRATUM	EQUIPM		FIELD	R
- '''	Mail AL 1.	NO	PEN/REC	DEPTH (FT)	BLOWS/6"	BURMISTER CLASSIFICATION	DESCRIPTION	INSTAL	LED_	TESTING	K
11	3	G-29		240+		Black and white grained GRANITE (slight		В	1 1	ND	Ì
	2					gray/green tinit, fine to coarse SAND, sized	SOFTER COARSER	İ			l
	2					grains).	GRAINED				
	2						GRANITE	R	ļ i		1
45	2								ļ		
	2							s			1
	2					}		E	В		
	3]		R	E		1
	3]			N		
	3	 				7			s		İ
50		G-30	 	250+		Black and white grained GRANITE		1 1	ĮΕ	ND	
	+	G-30	 	2507	· · · · · ·	More gray Silt, larger granite fragments	252'		A		1
	3	 				(no green)	253']	L		
	2	-	 				254' SOFT	1 1		ŀ	1
	2	+-	 	 	 	1	255' ZONE]	A		
55	5	┼	 	+	+	₹		1 1	a		1
	5	 -	 	+	 				U	1	
	3_	┼	 	 	 	†		1	A		
	3	┼	 -		 	┥	HARDER			1	ŀ
	3	┼		-	 	┪ .	ROCK	1 1	G	į	
26 0	3	-		_			110011	1 1	R	ND	-
	3_	G-31	 	260+		Black and white GRANITE		1	0	1	-
	3	↓—		 	-	More medium to coarse fragments, trace			U		
	3_	↓ —			 	Gravel-more gray sift		1	Īτ		Ì
	3	ļ	<u> </u>		 			1 1	ľ		
265	3	↓									
	3	_				-		1	-	ŀ	-
	3					-					-
	4					Large fragment, more white silt, drill rig	268'		1		Ì
	5				<u> </u>	bucks and grinds, purple and green crystals		1	-		1
270	2					_		1 1	1	ND	- 1
	2	G-3	2	270+		Green to gray GRANITE with little black and		1			-
	2					trace purple large flat fragments)	272'				- 1
	1						273' FRACTURES		1		- 1
	2				_	_	1.		1		- 1
275	, 2						275'	275'	1111	-	
	1					Fracture: (275'+)			Flint		
	2	1							Shot		
ŀ	2						SOFTER		Seal		-
1	1								120,000		
280								279'	L_		

REMARKS:

NOTES:

GZA

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL.

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ZA GEOENVIRONMENTAL INC.
O BROADWAY, PROVIDENCE, RHODE ISLAND

REPORT OF BORING NO. MW97-ML10 SHEET 8 OF 8 FILE NO. 31842 CHKD BY EAS

GEOTECH/GEOHYDROLOGICAL CONSULTANTS

DPTH	MIN			SAMPLE		SAMPLE DESCRIPTION	STRATUM	EQUIPMENT	FIELD	R
	FT_	NO	PEN/REC	DEPTH (FT)	BLOWS/6*	BURMISTER CLASSIFICATION	DESCRIPTION	INSTALLED	TESTING	К
81	2	G-33		280+		Green/gray/white GRANITE fragments, gray	GRAY GRANITE	B		
	2					Silts		 「		
	3							<u> </u>		1 1
Ī	3					<u>]</u>		C C		
285	3							ĬT <u>B</u>		
ا ```	3						ļ	E E		! '
t	2_					FRACTURE (287'+)	287'	B E		21
1	2					7	FRACTURE ZONE	N_		
- 1						7		s		
	2		 				290'	J a		١.
290	2		 	290+		Green black/gray GRANITE fragments, gray		N L		ļ
	2	G-34	 	2804	<u> </u>	Sitts (fragments as large as fine GRAVEL)	GRADUALLY	D .		1
	3	 	 	 		Onis (nagmonis as majo as mis over es)	HARDER GRANITE		1	
	3	-	 			1				
	- 5	-	-	 		→ White/gray trace black GRANITE				1
295	7	┼	 		 	Willey gray frace black driving	ļ			
	5	┼		 		4				
ļ	3_	 	<u> </u>	<u> </u>		┥				
1	3	↓	<u> </u>			-	1			22
	3	 	<u> </u>	ļ <u>.</u>		Green/gray/black GRANITE, fragments				23
300	3_	G-35		300+	 	gray Silts		A (100) A (100)		24
1	<u></u>					END OF EXPLORATION AT 300'±				25
1						_				26
		<u> </u>				_	1			27
}		<u> </u>				_				''
1										
1						_]				
1				ļ			:		Ì	1
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1						7				-
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	\vdash			 						
1	\vdash	+			+	\dashv				

REMARKS:

GZA

- 21. Air hammer returns medium to coarse GRAVEL fragments of broken rock.
- 22. Reached bottom 300' at 11:10 hours on 1/15/97 developed borehole for 4 hours pumping and surging with 6-inch surge blocks. Borehole makes ±1.5 gpm water
- 23. On 1/16/97 Colog, Inc. performed geophysical logging including: 3-arm borehole caliper, fluid temperature and resistivity, acoutic borehole televiewer, and heat-pulse flow meter logging.
- 24. Between 1/29 and 2/5/97, the borehole was packer tested using 16 10-foot long test intervals selected based on geophysical logging from 70 to 300 feet.
- 25. On 2/24/97 a short duration specific capacity test was performed while purging a volume of water equal to that lost to the formation during packer testing.
- 26. Based on the results of borehole geophysics, packer testing and discrete zone analytical sampling, two 2-inch ID Sch. 80 monitoring wells were installed to depths of 300' and 80' with a 20' and 10' foot 0.01" slotted screen, respectively. See equipment diagram for further installation details.
- 27. On 3/11/97, GZA installed QED "Well Wizard" dedicated bladder pump sampling systems in each monitoring well.

1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES; TRANSITIONS MAY BE GRADUAL. NOTES:

2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED; FLUCTUATIONS OF GROUNDWATER TABLE

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